

REMARKS

The Official Action mailed January 29, 2003 has been received and its contents carefully noted. Filed concurrently herewith is a *Request for One Month Extension of Time*, which extends the shortened statutory period for response to May 29, 2003. Accordingly, the Applicant respectfully submits that this response is being timely filed.

The Applicant notes with appreciation the consideration of the Information Disclosure Statements filed on June 8, 1999 and August 21, 2001.

Claims 2-13 and 20-23 are pending in the present application, of which claims 2-6, 8, 20 and 21 are independent. Claim 4 and 5 are withdrawn from consideration. Independent claims 2, 3, 20 and 21 have been amended to correct minor typographical errors and to better recite the features of the present invention. For the reasons set forth in detail below, these claims are believed to be in condition for allowance.

The broad concept of the present invention is a method of manufacturing a semiconductor device, comprising a first step of forming a semiconductor film over a substrate; a second step of holding a catalytic element that promotes the crystallization of said semiconductor film in contact with an entire surface of said semiconductor film; a third step of irradiating a laser beam whose irradiation area in one shot is 10 cm² or more to said semiconductor film to crystallize said semiconductor film and to form a crystalline semiconductor film; a fourth step of patterning said semiconductor film to form at least first and second semiconductor islands after the irradiation of the laser beam, and a fifth step of forming at least first and second thin film transistors, using said at least first and second semiconductor islands, wherein a pixel matrix circuit comprises said first thin film transistor and a driver circuit comprises said second thin film transistor.

Paragraph 2 of the Official Action rejects claims 2-3, 6-13, and 20-23 as obvious based on the combination of U.S. Patent No. 5,830,784 to Zhang et al., U.S. Patent No. 5,569,610 to Zhang et al., and U.S. Patent No. 5,869,803 to Noguchi et al. The Applicants respectfully traverse the rejection because the Official Action has not made a *prima facie* case of obviousness.

As stated in MPEP §§ 2143-2143.01, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims. The Official Action asserts that the feature of "a pixel matrix circuit comprising the first thin film transistor and a driver circuit comprising the second thin film transistor, ... would not be given any patentable weight" (p. 2, Paper No. 23). The examiner cites Ex parte Pfeiffer, 135 USPQ 31, 33 (Bd. App. 1961) for the proposition that structural limitations are not given weight in a method claim unless those limitations "affect the method in a manipulative sense, and not to amount to mere claiming of a use of a particular structure" (p. 3, Paper No. 23). The Examiner appears to cite Pfeiffer in order to form a *per se* rule that structural limitations do not patentably distinguish over the prior art in a method claim. However, the Federal Circuit held that there are no *per se* rules when determining obviousness under 35 U.S.C. § 103. In re Ochiai, 71 F.3d 1565, 37 USPQ2d 1127 (Fed. Cir. 1995). To paraphrase the court in Ochiai, 71 F.3d at 1570, 37 USPQ2d at 1132, "there are not [Pfeiffer] obviousness rejections . . . but rather only section 103 obviousness rejections."

The Applicant respectfully submits that the feature of a pixel matrix circuit comprising said first thin film transistor and a driver circuit comprising said second thin film transistor must be given patentable weight, because the recited features are part of the method steps of the present invention. It is respectfully submitted that the present invention includes steps of forming a semiconductor film over a substrate, irradiating a laser beam to crystallize said semiconductor film and to form a crystalline semiconductor film, patterning said semiconductor film to form at least first and second semiconductor islands after the irradiation of the laser beam, and forming at least first and second thin film transistors using the first and second semiconductor islands, where a pixel matrix circuit comprises said first thin film transistor and a driver circuit comprises said second thin film transistor. As such, the pixel matrix circuit and the driver circuit are formed from the semiconductor film which is formed by the steps recited in the claims. Therefore, the present invention includes the feature that the pixel matrix circuit and the driver circuit are formed over a same substrate. In other words, the semiconductor film of the present invention is a TFT of a pixel matrix circuit and a TFT of a driver circuit.

It appears that the Official Action is conceding that the cited prior art references do not teach or suggest that the pixel matrix circuit and the driver circuit are formed from the semiconductor film which is formed by the steps recited in the claims. Specifically, for example, Zhang '784 does not teach or suggest a pixel matrix circuit and a driver circuit formed over a same substrate or a step of holding a catalytic element that promotes the crystallization of said semiconductor film in contact with an entire surface of said semiconductor film. Also, Zhang '610 does not teach or suggest irradiating a laser beam, where the semiconductor film is a TFT of a pixel matrix circuit and a TFT of a driver circuit, after holding a catalytic element that promotes the crystallization of said semiconductor film in contact with an entire surface of said semiconductor film.

Noguchi does not cure the deficiencies in either Zhang '784 or Zhang '610. The Official Action relies on Noguchi to teach an irradiation area of 36 cm² or more. Zhang '784, Zhang '610 and Noguchi, either alone or in combination, do not teach or suggest that the pixel matrix circuit and the driver circuit are formed from the semiconductor film which is formed by the steps recited in the claims.

Since Zhang '784, Zhang '610 and Noguchi, either alone or in combination, do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) is in order and respectfully requested.

The Official Action rejects claims 6-13 as obvious based on the combination of Zhang '784, Zhang '610, JP 9312260A to Ohtani et al., and Noguchi. Ohtani does not cure the deficiencies in Zhang '784, Zhang '610 and Noguchi. The Official Action relies on Ohtani to teach removal of a crystallization promoting element. Zhang '784, Zhang '610, Ohtani, and Noguchi, either alone or in combination, do not teach or suggest a pixel matrix circuit and a driver circuit formed over a same substrate, a step of holding a catalytic element that promotes the crystallization of said semiconductor film in contact with an entire surface of said semiconductor film, irradiating a laser beam, where the semiconductor film is a TFT of a pixel matrix circuit and a TFT of a driver circuit, after holding a catalytic element that promotes the crystallization of said semiconductor film in contact with an entire surface of said semiconductor film. Since Zhang '784, Zhang '610, Ohtani, and Noguchi do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) is in order and respectfully requested.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claims 2, 3, 20 and 21 as follows:

2. (Amended) A method of manufacturing a semiconductor device, comprising:

a first step of forming a semiconductor film over a substrate;

a second step of holding a catalytic element that promotes the crystallization of said semiconductor film in contact with an entire surface of said semiconductor film;

a third step of irradiating a laser beam shaped in a rectangle or a square while moving the laser beam from one side of said semiconductor film toward another side thereof to sequentially crystallize said semiconductor film to form a crystalline semiconductor film;

a fourth step of patterning said semiconductor film to form at least first and second semiconductor islands after the irradiation of the laser beam, and

a fifth step of forming at least first and second thin film transistors, using said at least first and second semiconductor [island] islands,

wherein a pixel matrix circuit comprises said first thin film transistor and a driver circuit comprises said second thin film transistor, and

wherein said laser beam has an irradiation area of [said pulsed laser beam of] 10 cm² or more.

3. (Amended) A method of manufacturing a semiconductor device, comprising:

a first step of forming a semiconductor film on a substrate having an insulating surface;

a second step of holding a catalytic element that promotes the crystallization of said semiconductor film in contact with an entire surface of said semiconductor film;

a third step of irradiating a laser beam shaped in a rectangle or a square from one side of said semiconductor film toward another side thereof while moving said substrate to sequentially crystallize said semiconductor film to form a crystalline semiconductor film,

a fourth step of patterning said semiconductor film to form at least first and second semiconductor islands after the irradiation of the laser beam, and

a fifth step of forming at least first and second thin film transistors, using said at least first and second semiconductor islands,

wherein a pixel matrix circuit comprises said first thin film transistor and a driver circuit comprises said second thin film transistor, and

wherein said laser beam has an irradiation area of [said pulsed laser beam of] 10 cm² or more.

20. (Amended) A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

providing an entire surface of said semiconductor film with a crystallization promoting material comprising a metal;

crystallizing said semiconductor film by irradiating said semiconductor film with a pulsed laser beam,

patterning said semiconductor film to form at least first and second semiconductor islands after the irradiation of the laser beam, and

forming at least first and second thin film transistors, using said at least first and second semiconductor islands,

wherein a pixel matrix circuit comprises said first thin film transistor and a driver circuit comprises said second thin film transistor, [and]

wherein said laser beam has a pulse width of 200 nsec or more, and

wherein said laser beam has an irradiation area of [said pulsed laser beam of] 10 cm^2 or more.

21. (Amended) A method of manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film on an insulating surface;

providing an entire surface of said semiconductor film with a crystallization promoting material comprising a metal;

crystallizing said semiconductor film by irradiating said semiconductor film with a pulsed laser beam having a square shape cross section,

patterning said semiconductor film to form at least first and second semiconductor islands after the irradiation of the laser beam, and

forming at least first and second thin film transistors, using said at least first and second semiconductor islands,

wherein a pixel matrix circuit comprises said first thin film transistor and a driver circuit comprises said second thin film transistor, and

wherein said laser beam has a pulse width of 200 nsec or more, and an irradiation area of said [pulsed] laser beam is 10 cm^2 or more.